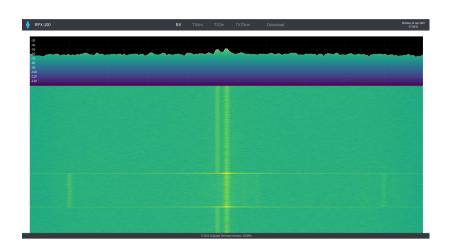
The Austrian Amateur Radio Society (ÖVSV) establishes a new digital transmission procedure allowing high speed data communication in Sub-GHz Frequency bands. Requirements are to use a wideband transmission mode to support state of the art bandwidth for each user, and to enable multiple users at the same time to connect to a base station providing access to HAMNET.

The implementation is be based on the concept of a software defined radio using commercial available hardware and open source software. This addresses and motivates a larger community of developers and radio amateurs.

Hardware and software are designed as kit, the RPX-100, which allows a modular use and supports all possible Sub-GHz frequency bands.

The Institute of Telecommunications of TU-Wien has successfully requested a permit to test operation of such a new digital communication system at 52-54MHz in the 6m band. Multi user access is achieved by using OFDMA as channel access methodology based on IEEE 802.22 (WRAN) standard.

The project has been granted a funding from Amateur Radio Digital Communications (ARDC) in March 2022 following an evaluation by an international Grants Advisory Committee.



A Wifi interface connects the RPX-100 with the LAN for remote operation, debugging and programming.

The software is written in C++ using liquid-dsp libraries and includes a WEB Waterfall Spectrum based on RFC 6455 to monitor HF activity remotley.

RPX-100 Transceiver Kit for Radio Amateurs

The RPX-100 is a modular kit for a software defined transceiver using standard embedded boards running linux such as the Google Coral Board utilizing CPU and TPU.

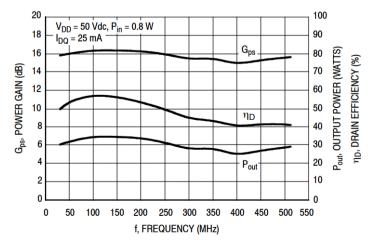


Most common Software Defined Radios with USB interface are supported, testing was done with the LimeSDR mini. The Kit includes a Radio Frontend with software defined band pass filters and a calss A amplfier with output power of 10W and is designed with a form factor to fit the board96 standard.

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Specifications V1.5:

- Supply Voltage 12V/48V for mobile operation or 220V with internal PSU.
- Software defined filters and Class A amplifier for 6m,
 2m and 70cm Radio Amateur bands.
- Premaplifier with 24dBm and Class A power amplifier for 30 - 512 MHz with 10W (max. 30W):



- Linux Operating System (Debian) enabling devlopers to write new sourcecode
- Optional extentions:
 - o 4.3 inch touch screen
 - o Internal speakers and microphone
 - External microphon with PTT

It is operated at 12V/48V to allow power supply via the build-in power unit or via an external source. Interfaces such as GPIO, Disply Boards, etc. are available for optional add-ons such as display, Microphone or buttons and keyboard. Alternatively a Raspberry Compute Module 4 or the Ordoid C4 can be used as embedded CPU.



Austrian Radio Amateur Association

 Native C++ software stack, using liquid-dsp libraries, no framework required.



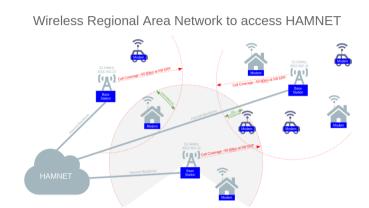
• RPX-100 Schematic as PDF file

OE3BIA, OE1VMC, OE9RIR, OE9RWV Email: info@rpx-100.net



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- Bill of Material as CSV file
- · Bill of Material as XLS file



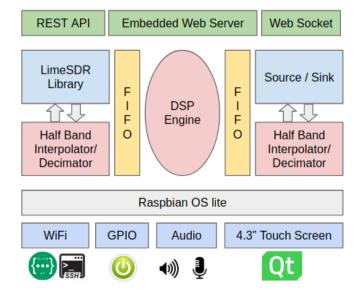
The concpet of the WRAN software uses the IEEE 802.22 frame structure for prototyping to make use of super frames and preambles for cognitive channel management, which allows a dynamic resource allocation between base stations, but also between multiple users at one base station.

Orthogonal Frequency Division Multiple Access (OFDMA) is used in the upper layers, as Modulation techniques QPSK, 16-QAM and 64-QAM is supported.

The software will support a connection-oriented MAC layer with cognitive functionality for dynamic and adaptive scheduling and management of coexistence of base stations in the same time-frequency domain (superframes).

The Wireless Regional Area Network – WRAN is establishing a new digital transmission procedure allowing high speed data communication in Sub-GHz Frequency bands usinf the IEEE 802.22 standard. This research project implements of a new digital communication system will be based on the concept of a software defined radio using commercially available hardware and open source software.

Hardware and software design of a base station and CPE-like user device shall allow a modular use with different radio front ends supporting all possible Sub-GHz frequency bands. The Austrian Radio Amateur Society (ÖVSV) together with the Institute of Telecommunication of the Vienna University of Technology have been granted a permit by the Austrian government to test operation of such a new digital communication system in HF, VHF and UHF frequency bands.



Goals of the WRAN project:

- Evaluate and select appropriate wireless communication protocol similar to existing Wireless LAN protocols but suitable for the VHF and UHF bands.
- Define a new transmission protocol for wideband data communication for efficient use of a 2Mhz spectrum in the 6m or 70cm band and suitable as "last mile" connection for existing backbone networks.
- Software development and implementation of the transmission protocol on a prototype SRD hardware for a base station and end users devices.
- Test and evaluation the new transmission protocol in lab- and field environments on selected Radio Amateur Relay locations in Austria.

- Benchmark how reliability and scalability such a new transmission protocol can be operated in the HF, VHF and UHF band.
- Provide a kit for Radio Amateurs to build and develop their own base stations and end-user devices for the new transmission protocol.

Project Milestones:

- The Institute of Telecommunications of TU Wien has been granted a test permit by the Federal Ministry of Agriculture, Regions and Tourism to test and operate the new transmission scheme at a 2 MHz Band from 52-54 MHz at 2 selected location in Austria. The permit has been extended for one year till May 2022.
- The IEEE 802.22 frame structure has been selected for prototyping the software and hardware to make use of super frames and preambles for cognitive channel management, which allows a dynamic resource allocation between base stations, but also between multiple users at one base station.
- The new hardware and software stack has been successfully tested using the Raspberry Compute Module CM4 in combination with LimeSDR mini.
 The advantages are a small form factor, performance and the 12V supply Voltage for mobile operation.
- A Radio Frontend has been developed and tested for VHF and UHF (6m, 2m and 70cm Band) with a design to fit as hat-board to the Raspberry CM4 IO board and operates with 12V supply voltage. The Output power can be regulated via software between 0 - 10W.

